

**Office Action Summary**

Application No.

10/736,783

Applicant(s)

HONJOU ET AL.

Examiner

Maureen G. Arancibia

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4-12,14-21 and 24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-12,14-21 and 24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 27 September 2007 has been entered.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 1, 2, 6-8, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of U.S. Patent 6,613,587 to Carpenter et al.**

In regards to Claim 1, AAPA teaches a plasma processing apparatus (Figure 1), comprising: a plasma chamber 607 in which a high-density plasma is generated; a sample chamber 601 in communication with the plasma chamber for housing a sample 603 to be processed using the plasma; and a protection tube 620 for protecting an inner wall of the plasma chamber from deposition of a product that results from the plasma processing.

AAPA does not expressly teach that the protection tube is composed of a plurality of pieces, wherein a longest one of said pieces in axial length is disposed farthest from the sample chamber among the plurality of pieces.

Carpenter et al. teaches that a protection tube 30 is composed of a plurality of pieces 31-38 that can differ in length, wherein at least some of the pieces can be sized for passing through a passageway into and out of the chamber. (Column 4, Lines 5-22; Figure 2)

It would have been obvious to one of ordinary skill in the art to modify the protection tube taught by AAPA for it to be composed as taught by Carpenter et al. The motivation for modifying the protection tube to be comprised of a plurality of pieces, as taught by Carpenter et al. (Column 1, Lines 45-57; Column 4, Lines 5-22), would have been to allow damaged sections of the protection tube to be replaced without having to replace the entire protection tube and without having to disassemble the plasma chamber.

It further would have been obvious to one of ordinary skill in the art to form the plurality of pieces in variable lengths, as taught by Carpenter et al., for the predictable result of differentiating the pieces from each other, and providing a user with a visual check to make sure that the damaged sections are replaced with the matching replacements.

The combination of AAPA and Carpenter et al. does not expressly teach that the longest one of the pieces in axial length is disposed farthest from the sample chamber among the plurality of pieces.

However, one of ordinary skill in the art would have recognized from the disclosure of AAPA (Specification, Page 4, Line 1- Page 5, Line 25) that there had been a recognized problem or need in the art including a design need to solve the problem of providing a protection tube in a plasma environment that would be resistant to thermal fatigue and breakage.

One of ordinary skill in the art further would have recognized that in combining the teachings of AAPA and Carpenter et al., there would have been a finite number of identified predictable arrangements of the order of stacking the plurality of pieces varying in axial length to form the protection tube.

Thus, it would have been obvious to a person of ordinary skill in the art, in combining the teachings of AAPA and Carpenter et al., to try, with a reasonable expectation of success, any of the finite number of arrangements of the plurality of variable-length pieces forming the protection tube, including the claimed arrangement wherein the longest piece disposed farthest from the sample chamber taught by AAPA. It would have been obvious to one of ordinary skill in the art to do so for the predictable result of providing a protection tube that would be resistant to thermal fatigue and breakage, as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp.

In regards to Claim 2, AAPA teaches that the plasma chamber 607 and the protection tube 620 are tubular in shape (Figure 1). The combination of AAPA and Carpenter et al. teaches that the plurality of pieces are tubular members disposed in an axial direction of the protection tube to comprise the protection tube.

In regards to Claim 6, AAPA teaches that the protection tube is made of quartz.  
(Specification, Page 4, Line 1)

In regards to Claims 7 and 8, AAPA teaches that the apparatus is an electron cyclotron resonance plasma apparatus that subjects the sample to sputtering.  
(Specification, Page 2, Line 2)

In regards to Claim 24, the combination of AAPA and Carpenter et al. just discussed does not expressly teach how the plurality of pieces of the protection tube are coupled to each other.

Carpenter et al. additionally teaches that the plurality of pieces of protection tube 30 can coupled with tongue and groove interconnections (Figure 2; Column 4, Lines 34-36), wherein the plurality of pieces include: a first piece (any of, for example, pieces 31-37) having a first end (a lower end in the view of Figure 2) and a second piece (any of, for example, pieces 32-38) having a second end (an upper end in the view of Figure 2) to be inserted into the first end of the first piece.

It is implicit in the teachings of Carpenter et al. that the inner diameter of the insertion aperture of the first end is greater than an outer diameter of the insertion protrusion of the second end, in order for the insertion protrusion of the second end to fit inside of the insertion aperture of the first end.

It is considered that the tongue and groove interconnections taught by Carpenter et al. would couple the first and second ends loosely, *as broadly recited in the claim*, so as not to prevent the expansion of the other piece, *as broadly recited in the claim*. The

tongue and groove interconnection would still allow *at least a small amount of thermal expansion of each piece in some direction at some point along the length of the piece.*

It would have been obvious to one of ordinary skill in the art to modify the combination of AAPA and Carpenter et al. to have the pieces of the protection tube be coupled to each other via tongue and groove interconnections, as taught by Carpenter et al. The motivation for doing so, as would have been apparent to one of ordinary skill in the art at the time of the invention, would have been to allow for easy alignment, assembly, and disassembly of the liner pieces.

**4. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Carpenter et al. as applied to claim 1 above, and further in view of U.S. Patent 6,797,639 to Carducci et al.**

The teachings of AAPA and Carpenter et al. were discussed above.

In regards to Claims 4 and 5, the combination of AAPA and Carpenter et al. does not expressly teach that the protection tube is provided with a plurality of grooves on the inner wall thereof in parallel with an axis of the protection tube at substantially equal circumferential intervals (i.e. evenly spaced longitudinal grooves).

Carducci et al. teaches that a protection tube 118 can be provided with evenly spaced longitudinal grooves 1810. (Figure 20; Column 18, Lines 1-2)

It would have been obvious to one of ordinary skill in the art to modify the combination of AAPA and Carpenter et al. to provide the protection tube with a plurality of evenly spaced longitudinal grooves on the inner wall thereof. The motivation for making such a modification, as taught by Carducci et al. (Column 16, Line 33 - Column

17, Line 39), would have been to increase adhesion of deposited films on the protection tube and thereby reducing flaking of such films into the chamber and subsequent substrate contamination or damage.

**5. Claims 9-12 and 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Carpenter et al. as applied to claims 1, 2, and 6-8, and further in view of U.S. Patent 6,408,786 to Kennedy et al.**

The teachings of AAPA and Carpenter et al. were discussed above in regards to Claim 1.

In regards to Claims 9 and 10, the combination of AAPA and Carpenter et al. does not expressly teach that the plasma is an inductively coupled plasma or a helicon wave plasma.

Kennedy et al. teaches that ECR, inductive coupling, and helicon wave are equivalent means of generating plasma.

It would have been obvious to one of ordinary skill in the art to select any of ECR, inductive coupling, or helicon wave as art-recognized equivalent means to generate a plasma. It has been held that an express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982).

In regards to Claim 11, AAPA does not expressly teach that a protection tube can be disposed in the sample chamber.

Kennedy et al. teaches that a tubular protection tube 20 can be disposed in a sample chamber 2.

It would have been obvious to one of ordinary skill in the art to modify the apparatus taught by AAPA to dispose a protection tube in the sample chamber. The motivation for doing so, as taught by Kennedy et al. (Column 1, Lines 56-58), would have been to protect the walls of the *sample* chamber.

The combination of AAPA and Kennedy et al. does not expressly teach that the protection tube is composed of a plurality of pieces, wherein a longest one of said pieces in axial length is disposed farthest from the plasma chamber among the plurality of pieces.

Carpenter et al. teaches that a protection tube 30 is composed of a plurality of pieces 31-38 that can differ in length, wherein at least some of the pieces can be sized for passing through a passageway into and out of the chamber. (Column 4, Lines 5-22; Figure 2)

It would have been obvious to one of ordinary skill in the art to modify the protection tube taught by AAPA and Kennedy et al. for it to be composed as taught by Carpenter et al. The motivation for modifying the protection tube to be comprised of a plurality of pieces, as taught by Carpenter et al. (Column 1, Lines 45-57; Column 4, Lines 5-22), would have been to allow damaged sections of the protection tube to be replaced without having to replace the entire protection tube and without having to disassemble the plasma chamber.

It further would have been obvious to one of ordinary skill in the art to form the plurality of pieces in variable lengths, as taught by Carpenter et al., for the predictable result of differentiating the pieces from each other, and providing a user with a visual



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check to make sure that the damaged sections are replaced with the matching replacements.

The combination of AAPA, Kennedy et al., and Carpenter et al. does not expressly teach that the longest one of the pieces in axial length is disposed farthest from the plasma chamber among the plurality of pieces.

However, one of ordinary skill in the art would have recognized from the disclosure of AAPA (Specification, Page 4, Line 1- Page 5, Line 25) that there had been a recognized problem or need in the art including a design need to solve the problem of providing a protection tube in a plasma environment that would be resistant to thermal fatigue and breakage.

One of ordinary skill in the art further would have recognized that in combining the teachings of AAPA, Kennedy et al., and Carpenter et al., there would have been a finite number of identified predictable arrangements of the order of stacking the plurality of pieces varying in axial length to form the protection tube.

Thus, it would have been obvious to a person of ordinary skill in the art, in combining the teachings of AAPA, Kennedy et al., and Carpenter et al., to try, with a reasonable expectation of success, any of the finite number of arrangements of the plurality of variable-length pieces forming the protection tube, including the claimed arrangement wherein the longest piece disposed farthest from the plasma chamber taught by AAPA. It would have been obvious to one of ordinary skill in the art to do so for the predictable result of providing a protection tube that would be resistant to thermal

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fatigue and breakage, as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp.

In regards to Claim 12, AAPA teaches that the sample chamber 601 is tubular. (Figure 1) The combination of AAPA, Kennedy et al., and Carpenter et al. teaches that the plurality of pieces are tubular members disposed in an axial direction of the protection tube to comprise the protection tube.

In regards to Claim 16, the combination of AAPA, Kennedy et al., and Carpenter et al. just discussed does not expressly teach that the protection tube in the sample chamber is made of quartz.

AAPA teaches that a protection tube can be made of quartz. (Specification, Page 4, Line 1)

It would have been obvious to one of ordinary skill in the art to form the protection tube in the sample chamber out of quartz, as well. The motivation for doing so would have been to select an art-recognized (AAPA) suitable material for manufacturing the protection tube.

In regards to Claims 17 and 18, the apparatus taught by combination of AAPA, Carpenter et al., and Kennedy et al. would be inherently structurally capable of performing the intended use of subjecting the sample to etching or chemical vapor deposition, based on the process conditions such as the type of gas selected and the power settings. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). Also, a claim containing a

“recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

In regards to Claim 19, see the discussion of Claim 8 above.

In regards to Claims 20 and 21, see the discussion of Claims 9 and 10 above.

**6. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Carpenter et al., and further in view of Kennedy et al. as applied to claim 11 above, and further in view of Carducci et al.**

The teachings of AAPA, Carpenter et al., and Kennedy et al. were discussed above.

In regards to Claims 14 and 15, the combination of AAPA, Carpenter et al., and Kennedy et al. does not expressly teach that the protection tube is provided with a plurality of grooves on the inner wall thereof in parallel with an axis of the protection tube at substantially equal circumferential intervals (i.e. evenly spaced longitudinal grooves).

Carducci et al. teaches that a protection tube 118 can be provided with evenly spaced longitudinal grooves 1810. (Figure 20; Column 18, Lines 1-2)

It would have been obvious to one of ordinary skill in the art to modify the combination of AAPA, Carpenter et al., and Kennedy et al. to provide the protection tube with a plurality of evenly spaced longitudinal grooves on the inner wall thereof. The motivation for making such a modification, as taught by Carducci et al. (Column 16,

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Line 33 - Column 17, Line 39), would have been to increase adhesion of deposited films on the protection tube and thereby reducing flaking of such films into the chamber and subsequent substrate contamination or damage.

### ***Response to Arguments***

7. Applicant's arguments filed 27 September 2007 have been fully considered but they are not persuasive.

In response to Applicant's arguments against the references individually, specifically, that Carpenter et al. alone or Kennedy et al. alone does not teach the positional relationship between the plurality of pieces and the sample or plasma chamber, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In response to Applicant's argument that there is no motivation to combine the teachings of AAPA and Carpenter et al. because Carpenter et al. does not teach protecting an inner wall of a plasma chamber against temperature gradients or preventing breakage of the protection tube, and in response to Applicant's argument that coupling the first and second ends of first and second pieces loosely reduces internal stress resulting from thermal expansion, the fact that Applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

**Conclusion**

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571) 272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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